August 18, 2003

National Highway Traffic Safety Administration
Re: Docket No. NHTSA-2002-12538

Dear Sir or Madam:

Over the past two years, the Pennsylvania Transportation Institute at the Pennsylvania State University has been conducting research on the comprehension and visibility of the ASAE's Slow Moving Vehicle (SMV) emblem. As principal investigator on that research I became aware of NHTSA's Federal Motor Vehicle Safety Standards; Low Speed Vehicles; Notice of Proposed Rulemaking [Docket No. NHTSA–2002–12538], which discussed (among other things) the possibility of requiring the SMV emblem on all low speed vehicles (LSVs). I believe that using the SMV emblem on LSVs is a wise vehicle safety decision, but it is important that in requiring its use that NHTSA does not adopt the problems with the current emblem identified in our research. Those problems include a lack of uniformity of appearance in the day and at night, confusion with other roadway safety devices, and poor nighttime visual performance.

The SMV emblem looks different in the daylight than it does at night. The ASAE (1998) standard states, "The red-orange fluorescent triangle provides for daylight identification. The red retroreflective border appears as a hollow red triangle in the path of motor vehicle headlights at night." Therefore, the driver must know that a solid orange triangle in the daytime and a hollow red triangle at night both have the same meaning. This problem is a function of the era in which the emblem was originally designed. In 1962, sign material integrating retroreflective and fluorescent qualities did not exist; therefore, for the emblem to be visible in the daylight and at night, it had to be constructed using two types of materials: fluorescent (daylight visibility) and retroreflective (nighttime visibility). The result is a hybrid emblem that may be visible in daylight and at night, but visible as two dramatically different images. Relatedly, the shape and color of the SMV emblem at night is indistinguishable from warning triangles used to indicate a stalled vehicle. It is perhaps due to the lack of uniformity of day/night appearance, combined with this potential symbol confusion, that our research on the comprehension of the SMV emblem found it to be misinterpreted by more than 70 percent of the drivers we tested (*Garvey, P.M. (2003). Motorist comprehension of the slow moving vehicle (SMV) emblem. Journal of Agricultural Safety and Health Vol. 9(2), 171-180*).

In a follow-up to our comprehension evaluation we also discovered problems with the emblem's visibility (particularly at night, on curves, and under low beam headlamp illumination) that are a direct result of the retroreflective material specifications detailed in the current ASAE standard referenced in NHTSA's low speed vehicle NPR.

Only the emblem's outside red retroreflective material is visible at night. The ASAE standard specifies minimum coefficients of retroreflection for the red material in an attempt to provide adequate brightness at several entrance and observation angles, however the specified R_A values fall off sharply at entrance angles representative of frequently encountered roadway geometries (e.g., with 2 deg observation angle the minimum R_A at a 45 deg entrance angle is only 15 and this drops to an R_A of 4 at a 5 deg observation angle). Our field research of SMV emblems has shown that these minimum coefficients of retroreflection result in very low visibility on fairly moderate horizontal curvature. Our research also shows that by either improving the "angularity" of the retroreflective materials (e.g., using ASTM Type VIII or IX materials) or by using an SMV emblem that is internally illuminated (like high-mounted brake lights or tail lights, using its own light source instead of relying on the relationship between vehicle headlamps and reflective materials) the emblem's visibility on curves can be greatly enhanced.

For the sake of uniformity with other slow moving vehicles and to accommodate those drivers who do understand the current emblem's meaning, we believe that even though the current emblem has problems with driver comprehension and visibility, it would be best to maintain the emblem's ASAE-specified shape and colors, as introducing a totally new slow moving vehicle symbol for use on LSVs would only result in further confusion.

We recommend that when referencing the ASAE standard in the Final Rulemaking it be noted that the intent is to provide a symbol for LSVs that will identify them as slow moving vehicles and, instead of simply referring back to the ASAE standard in saying, for example,

> "The slow moving vehicle emblem would have to comply with the emblem maintained by the American Society of Agricultural Engineers (ANSI/ASAE S276.5 MAY98, Slow-Moving Vehicle Identification Emblem)."

the Final Rulemaking should say something like,

> "The slow moving vehicle emblem would have the shape and colors of the emblem maintained by the American Society of Agricultural Engineers (ANSI/ASAE S276.5 MAY98, Slow-Moving Vehicle Identification Emblem). However, the emblem would appear the same in the day and at night and would either, a) employ retroreflective materials that would ensure it's nighttime visibility under low beam head lamps and on curves (e.g., ASTM Type VIII or IX), or b) be internally illuminated (backlit) with a light source that provides sufficient illumination for the emblem to be visible in the day and at night."

This rewording would allow an SMV emblem for use on LSVs that provides uniformity with other slow moving vehicles (because the colors and shapes would be the same) and appropriate nighttime detection distances (because it would be visible on curves and with low beam illumination) without restricting LSVs to the use of ASAE specified retroreflective materials that our research has shown to be ill-equipped to ensure either motorist comprehension or symbol detection. That is, to ensure that the LSV emblem does not confuse motorists by appearing different in the day and at night and that does not result in inadequate nighttime emblem visibility on all but tangent roadways under high beam headlamp illumination.

Sincerely,

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